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TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. § 371

Rec'd PCT/PTO 25 JAN 2002

ATTORNEY'S DOCKET NUMBER: 449122020400

U.S. APPLICATION NO (If known, see 37 CFR 1.5): 10/031993 Not yet assigned

INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE00/02440	July 25, 2000	July 26, 1999

TITLE OF INVENTION
METHOD AND CIRCUIT FOR MONITORING AND OPTIONALLY CONTROLLING THE TRANSMISSION CAPABILITY OF A DATA TRANSMISSION CHANNEL

APPLICANT(S) FOR DO/EO/US
Stefan GEYER *et al.*

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is attached hereto (required only if not communicated by the International Bureau).
   b. ☐ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application under PCT Article 19 (35 U.S.C. 371(c)(2)).
   a. ☐ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made, however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5))

Items 11. to 16. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information: 1. International Search Report 2. IPER 3. Information Data Sheet 4 Return receipt postcard.

CERTIFICATE OF HAND DELIVERY

I hereby certify that this correspondence is being hand filed with the United States Patent and Trademark Office in Washington, D.C. on January 25, 2002.

Melissa Garton

Melissa Garton

dc-296805

JC19 Rec'd PCT/PTO 25 JAN 2002

APPLICATION NO (if known, see 37 CFR 1.5) not yet assigned 10/051993	INTERNATIONAL APPLICATION NO PCT/DE00/02240	ATTORNEY'S DOCKET NUMBER 449122020400

21. ☒ The following fees are submitted

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. . . $1,040.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO..... $890.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....$740.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provision of PCT Article 33(1)-(4) $710.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) $100.00

CALCULATIONS PTO USE ONLY

			ENTER APPROPRIATE BASIC FEE AMOUNT =	$890.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				$0	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	13 - 20 =	0	x $18.00	$0	
Independent claims	1 - 3 =	0	x $84.00	$0	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $280.00	$280	
			TOTAL OF ABOVE CALCULATIONS =	$1,170	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by ½. .				$0	
			SUBTOTAL =	$1,170	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).			+	$0	
			TOTAL NATIONAL FEE =	$1,170	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00 per property**			+	$40	
			TOTAL FEES ENCLOSED =	$1210	
				Amount to be refunded:	**$**
				charged:	**$**

a. ☒ Please charge my **Deposit Account No. 03-1952** in the amount of $1,210.00 to cover the above fees. Please reference 449122020400. A duplicate copy of this sheet is enclosed.

b. ☒ The Commissioner is hereby authorized to charge any additional fees that may be required, or credit any overpayment to **Deposit Account No. 03-1952**. Please reference 449122020400. A duplicate copy of this sheet is enclosed.

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NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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CERTIFICATE OF HAND DELIVERY

I hereby certify that this correspondence is being hand filed with the United States Patent and Trademark Office in Washington, D.C. on August 19, 2002.

Melissa Garton

Melissa Garton

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of:

Stefan GEYER et al.

Serial No.: 10/031,993

Filing Date: January 25, 2002

For: METHOD AND CIRCUIT FOR MONITORING AND OPTIONALLY CONTROLLING THE TRANSMISSION CAPABILITY OF A DATA TRANSMISSION CHANNEL

Examiner: Not yet assigned

Group Art Unit: Not yet assigned

PRELIMINARY AMENDMENT

BOX PCT
Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination on the merits, please amend this application as follows:

In the Claims:

3. (Amended) The method as claimed in claim 1, characterized in that the signals which are associated with a communication between the two data devices (PC, COC; POP) which is necessary for connection of a secondary channel are sent at the earliest possible time, in particular are transmitted with priority over existing data.

4. (Amended) The method as claimed in one of claims 1, characterized in that, in an integrated service digital network (ISDN) in which a switched virtual channel (Switched Virtual Circuit) which in places runs within a D channel is used as the primary channel and at least one B channel is used as the secondary channel, message signals for a bandwidth allocation protocol

are used to allocate the bandwidth and transmission capacity to be used before setting up a B channel, and is transmitted with priority over other data.

6. (Amended) A circuit arrangement having means for carrying out the method as claimed in claim 1, characterized in that at least one of two data devices (PC, COC; POP) which are connected to one another via a data transmission path (D, TL1, TL2) has an associated monitoring device (SIG, PRC), which allows a time comparison to be carried out between a measurement time interval from the emission of a test signal from the relevant data device (SUB) to the other data device (POP; PC, COC) until the arrival of a response signal from this other data device (POP; PC, COC) with a predetermined threshold value time (T1), and in that the relevant monitoring device (SIG, PRC) can emit a transmission capacity signal which corresponds to the respective time comparison result, in particular a report signal which indicates an overload state on the data transmission path (D, TL1, TL2), if said measurement time interval exceeds the relevant threshold value time.

8. (Amended) The method as claimed in claim 3, characterized in that, in an integrated service digital network (ISDN), a switched virtual channel (switched virtual circuit), which in places runs within a D channel, is used as the primary channel, and at least one B channel is used as the secondary channel.

10. (Amended) The method as claimed in claim 8, characterized in that, before setting up a B channel, message signals for a bandwidth allocation protocol are used to allocate the bandwidth and transmission capacity to be used, and are transmitted with priority over other data.

11. (Amended) A circuit arrangement for carrying out the method as claimed in claim 1, characterized in that at least one of two data devices (PC, COC; POP) which are connected to one another via a data transmission path (D, TL1, TL2) has an associated monitoring device (SIG, PRC), which allows a time comparison to be carried out between a measurement time interval from the emission of a test signal from the relevant data device (SUB) to the other data device (POP; PC, COC) until the arrival of a response signal from this other data device (POP;

PC, COC) with a predetermined threshold value time (T1), and in that the relevant monitoring device (SIG, PRC) can emit a transmission capacity signal which corresponds to the respective time comparison result, in particular a report signal which indicates an overload state on the data transmission path (D, TL1, TL2), if said measurement time interval exceeds the relevant threshold value time.

REMARKS

The above amendments are made to remove the multiple dependency from the claims.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with markings to show changes made**".

In the unlikely event that the transmittal letter is separated from this document and the Patent Office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket no. 449122020400. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

Respectfully submitted,

Dated: August 19, 2002

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

For the convenience of the Examiner, the changes made are shown below with deleted text in strikethrough and added text in underline.

In the Claims:

3. (Amended) The method as claimed in claim 1 ~~or 2~~, characterized in that the signals which are associated with a communication between the two data devices (PC, COC; POP) which is necessary for connection of a secondary channel are sent at the earliest possible time, in particular are transmitted with priority over existing data.

4. (Amended) The method as claimed in one of claims 1 ~~to 3~~, characterized in that, in an integrated service digital network (ISDN) in which a switched virtual channel (Switched Virtual Circuit) which in places runs within a D channel is used as the primary channel and at least one B channel is used as the secondary channel, message signals for a bandwidth allocation protocol are used to allocate the bandwidth and transmission capacity to be used before setting up a B channel, and is transmitted with priority over other data.

6. (Amended) A circuit arrangement having means for carrying out the method as claimed in ~~one of claims 1 to 5~~ **claim 1**, characterized in that at least one of two data devices (PC, COC; POP) which are connected to one another via a data transmission path (D, TL1, TL2) has an associated monitoring device (SIG, PRC), which allows a time comparison to be carried out between a measurement time interval from the emission of a test signal from the relevant data device (SUB) to the other data device (POP; PC, COC) until the arrival of a response signal from this other data device (POP; PC, COC) with a predetermined threshold value time (T1), and in that the relevant monitoring device (SIG, PRC) can emit a transmission capacity signal which corresponds to the respective time comparison result, in particular a report signal which indicates an overload state on the data transmission path (D, TL1, TL2), if said measurement time interval exceeds the relevant threshold value time.

8. (Amended) The method as claimed in ~~one of claims 3 to 7~~ **claim 3**, characterized in that, in an integrated service digital network (ISDN), a switched virtual channel (switched virtual circuit), which in places runs within a D channel, is used as the primary channel, and at least one B channel is used as the secondary channel.

10. (Amended) The method as claimed in claim 8 ~~or 9~~, characterized in that, before setting up a B channel, message signals for a bandwidth allocation protocol are used to allocate the bandwidth and transmission capacity to be used, and are transmitted with priority over other data.

11. (Amended) A circuit arrangement for carrying out the method as claimed in ~~one of claims 1 to 10~~ **claim 1**, characterized in that at least one of two data devices (PC, COC; POP) which are connected to one another via a data transmission path (D, TL1, TL2) has an associated monitoring device (SIG, PRC), which allows a time comparison to be carried out between a measurement time interval from the emission of a test signal from the relevant data device (SUB) to the other data device (POP; PC, COC) until the arrival of a response signal from this other data device (POP; PC, COC) with a predetermined threshold value time (T1), and in that the relevant monitoring device (SIG, PRC) can emit a transmission capacity signal which corresponds to the respective time comparison result, in particular a report signal which indicates an overload state on the data transmission path (D, TL1, TL2), if said measurement time interval exceeds the relevant threshold value time.

Description

Method and circuit arrangement for monitoring and, possibly, controlling the transmission capacity of a data transmission path

The invention relates to a method and a circuit arrangement for monitoring and, possibly, for controlling the transmission capacity of a data transmission path which exists between two data devices and is used for transmitting signals, in particular data signals, and on which a primary channel with a relatively low transmission capacity is used, whose magnitude possibly depends on influences which are outside the control of the two data devices, and which can be replaced or added to by means of one or more secondary channels having a relatively high transmission capacity.

The method mentioned above and the circuit arrangement mentioned above take particular account of the fact that the connection of a secondary channel must be initiated by one of the two data devices. In this case, situations can occur in which the relevant connection can be initiated only after the two data devices have been made aware of this by means of appropriate communication, which is handled via the primary channel.

However, in this context, a situation can arise in which the relevant connection - for example for transmitting a large amount of data that has occurred - is urgently required but in which, at the same time, the primary channel is already overloaded since a large amount of data is already being transmitted via it and/or since its capacity has been reduced owing to external influences, which are not under the control of the data terminal. In this case, any communication which is required before the initiation of the connection of a secondary channel between the data

devices cannot take place, or can take place only with a major delay, so that the urgently necessary connection of the secondary channel cannot take place, or can take place only with a major delay. This then makes the data transmission and the channel utilization very inefficient.

One procedure of the type just mentioned is now known, for example, in conjunction with the transmission of data signals between an ISDN basic access point and a selection node into a network which, as an IP-based network, that is to say a network operating on the basis of an Internet protocol, allows access to the Internet or to an Intranet, and is described in the document "Always On/Dynamic ISDN" by A. Kuzma, Intel Corporation, October 1997, which has been published by the Vendors' ISDN Association on the Internet at http://ww.via-ISDN.org/. This document furthermore describes the measures considered above, which allow data transmission via a data transmission path between a computer or personal computer which is associated with said ISDN basic access point and is also referred to as an AO/DI client (Always On/Dynamic ISDN), and a selection node into the IP-based Internet or Intranet. Such a selection node is also referred to as an AO/DI-PoP (Always On/Dynamic ISDN-Point of Presence).

With regard to the data transmission path mentioned above and having the relatively low transmission capacity, it should be noted here that this data transmission path is generally used not only for a connection between just one computer or personal computer and a selection node but, in places, is also at the same time used for a number of such connections, to be precise on a time division basis. With regard to the data signal transmission channels which are available in this way, the expressions logical channels or SVC channels (Switched Virtual Circuits) are also used.

Data signal transmission channels of the type under consideration at the moment are in each case formed in integrated service digital networks (ISDN) within auxiliary channels of a channel arrangement which comprises auxiliary channels and user channels. In the case of an ISDN communications network, which has already been in use for a long time, the auxiliary channel (referred to as the D channel) has a transmission capacity of, for example, 16 kbit/s; the relevant channel arrangement has at least one user channel, but normally two user channels each having a transmission capacity of 64 kbit/s.

The invention is now based on the object of finding a way in which, in a relatively simple manner, it is possible to monitor the transmission capacity of primary channel of a data transmission path between two data devices such that a requirement for additional transmission capacity for a data signal transmission which is to be carried out or is already taking place can be determined at an early stage, that is to say so that a secondary channel can be connected in good time.

With regard to a data transmission method of the type mentioned initially, the object described above is achieved according to the invention in that at least one of the two data devices emits separate test signals to the other data device at specific times via the primary channel of said data transmission path, in that, on receiving the relevant test signals, said other data device in each case sends back a response signal to said first data device via the primary channel of the data transmission path, which response signal either comprises the respective test signal itself or is a separate signal initiated by it, and in that the time interval between the transmission of a test signal by said first data device and the arrival of a response signal which is sent back to it from said other data device is compared with a predetermined threshold value time, which corresponds to a specific

transmission capacity of the primary channel of the data transmission path, forming a comparison result, in response to which a transmission capacity signal is formed, which corresponds to this result and by means of which, in particular, an overload state of the primary channel can be indicated.

The invention results in the advantage that the transmission capacity on said data transmission path can be monitored relatively easily, so that appropriate measures can be taken by the respective data device on the basis of the monitoring result available there and which can indicate, in particular, that the primary channel is overloaded. These measures mean that, in a situation where said transmission capacity signal indicates that said data signal transmission path is overloaded, the relevant data device requests additional transmission capacity in response to said transmission capacity signal. In the case of the channel arrangement at the ISDN basic access point, which was mentioned initially by way of example, the additional transmission capacity can then be provided by requesting at least one user channel or B channel in addition to the primary channel or D channel which has already been used for the data signal transmission, for data signal transmission as a secondary channel, and by also using this for data signal transmission.

Thus, according to the invention, overloading of the data transmission path which is being used can be identified at an early stage, and suitable measures, in particular the connection of a secondary channel, can be initiated immediately. If communication between the terminals via the primary channel is required to do this, then this can thus be carried out before the already overloaded primary channel is also loaded still further by the transmission of data.

The transmission of the respective test signal preferably activates a timer which emits an output

signal once a defined time interval has elapsed, and if the relevant output signal occurs before the arrival of said response signal, a transmission capacity signal is emitted which indicates an overload state on said data transmission path. This measure advantageously means that overloading of said data transmission path can even be identified in a situation in which no such response signal arrives at all, or such a response signal arrives only at a time such that the time interval between the transmission of a test signal and the arrival of a response signal sent back in response to it is greater than the threshold value time mentioned above.

The described monitoring of the transmission capacity can expediently be carried out at regular time intervals. However, it can also be carried out, as deliberate monitoring of the transmission capacity of said data transmission path, in particular when the amount of data which is to be transmitted from the first data device to said other data device is greater than a defined amount threshold value, and before the transmission of the relevant data.

This results in the advantage that it is possible to determine even before a data signal transmission whether the transmission capacity which is available for the transmission of the relevant data signals on said data transmission path is sufficient to avoid overloading. If the measure described above determines that the data transmission path will be overloaded by the transmission of the data signals that are present, then said first data device can request additional transmission capacity before the relevant data signal transmission, thus ensuring problem-free data signal transmission.

In the case of the measure considered last, it is advantageous for the transmission capacity of said data transmission path not to be deliberately monitored in

the situation where the time period düakt which has passed since the last monitoring of the transmission capacity is shorter than a defined time period dümin. This advantageously avoids the data transmission path which is normally used for data signal transmission being unnecessarily loaded by deliberate monitoring being carried out immediately after regular monitoring, and this data transmission path can be used virtually immediately for data signal transmission.

In this case, the time of the start of deliberate monitoring of the transmission capacity of said data transmission path will preferably be used as the new time of origin for regular monitoring of the transmission capacity of the relevant data transmission path in time intervals t. This results in the advantage that a sensible transition takes place from deliberate monitoring to regular monitoring of the transmission capacity of said data transmission path, preventing two monitoring processes from being carried out unnecessarily at a very short time interval after one another.

When said data transmission path is overloaded, or heavily loaded, said first data device expediently transmits, at the earliest possible time, signals to said other data device via the relevant data transmission path which are associated with a communication, which is necessary for connection of a secondary channel, between the two data devices, that is to say, in particular, is transmitted with priority over existing data.

This method has the advantage that the time period between identification of the requirement for a secondary channel and the connection of this channel is not unnecessarily lengthened.

In the already mentioned case of an integrated service digital communications network (ISDN), a switched

virtual channel (switched virtual circuit), part of which runs within a D channel, is preferably used as the primary channel, and a B channel is preferably used as the secondary channel. This advantageously allows efficient data signal transmission between the two said data devices in an integrated service digital communications network.

The message signals EchoRequest and EchoReply of an Internet link control protocol are expediently used as the test signal and response signal, respectively. This results in the advantage that it is possible to use signals in accordance with a transmission protocol which is used in any case.

It is furthermore advantageous if, before setting up a B channel, message signals for a bandwidth allocation protocol are used to allocate the bandwidth and transmission capacity to be used and are transmitted with priority over other data. In consequence, signals from an existing bandwidth allocation protocol can simply be used here.

In order to carry out the method according to the invention, it is possible to use a circuit arrangement which is characterized in that at least one of two data devices which are connected to one another via a data transmission path has an associated monitoring device, which allows a time comparison to be carried out between a measurement time interval from the emission of a test signal from the relevant data device to the other data device until the arrival of a response signal from this other data device with a predetermined threshold value time, and in that the relevant monitoring device can emit a transmission capacity signal which corresponds to the respective time comparison result, in particular a report signal which indicates an overload state on the data transmission path, if said measurement time interval exceeds the relevant threshold value time. This circuit arrangement

is distinguished by the advantage of particularly low circuit complexity.

A timer is expediently connected to said monitoring device, can be activated by said test signal, and emits an output signal to the relevant monitoring device once its operating time, which corresponds to an overload state of said data transmission path, has elapsed, which monitoring device uses this output signal, if the response signal from said other data device has not yet arrived, to emit a report signal which indicates the overload state of the data transmission path. This ensures, with particularly low circuit complexity, that overloading of said data transmission path can be identified even in a situation in which said response signal does not arrive at all, or arrives only at a time such that the time interval between the transmission of a test signal and the arrival of a response signal sent back in response to it is greater than the threshold value time mentioned above.

Before explaining the invention further with reference to an example, it should first of all also be noted that the method according to the invention has a specific application in an integrated service digital network, a so-called ISDN, as is specified by the ITU-T Series 1 Recommendations. In this case, a so-called D channel with a maximum of 16 kbit/s and two B channels each having 64 bit/s are available at a so-called basic access point (for connection of up to eight terminals to the network). A permanent connection between the basic access point and the network is produced via the D channel, to be more precise a connection to a network node which is suitable for this purpose, and is referred to as a local exchange. This is used firstly for interchanging messages between terminals and the local exchange, while, secondly, it also makes it possible to set up and operate a virtual channel, a so-called SVC channel (Switched Virtual Circuit) for data transmission to another terminal connected to the

network. The B channels are used when required; initiated by a terminal connected to the basic access point, these B channels are connected to other network subscribers selected by the initiating terminal.

In the method according to the invention, the SVC channel can be used as the primary channel between two data devices; the B channels can be used as secondary channels. The capacity of the SVC channel is, in this situation, naturally restricted to a value of less than or equal to 16 kbit/s. However, normally, there is no way in which this maximum capacity can be offered simultaneously to all the basic access points to a local exchange, since a large number of SVC channels occur, at least in places, on lines which are used jointly in a multiplexing mode. This generally takes place in the local exchange itself, and also on further sections of the route of the respective SVC channel in the network. The bandwidth available for each SVC channel thus depends not only on the utilization of the relevant SVC channel by the two terminals which it connects, but also on the influence of other stream of traffic.

The method which has already been mentioned in the introduction and which is entitled "Always On/Dynamic ISDN" (AO/DI, for short), and which has been described in the document with the same title cited above by A. Kuzma, Intel Corporation, October 1997, is now used in conjunction with data signal transmission in an integrated service digital network. In this case, firstly a so-called client, generally a personal computer connected to an ISDN basic access point, and secondly a so-called PoP (Point of Presence), which is likewise connected to the ISDN (but is also on the other hand connected to the Internet or to an Intranet and is used to provide clients with access to the Internet or to an Intranet) are used as data devices in the method described above. An SVC channel is used as the primary channel, in which case at least one

additional B channel can be set up as a secondary channel, when required, after previous negotiation between the client and PoP.

A range of protocols which have been standardized by the IETF (Internet Engineering Task Force), in particular the "Link Control Protocol" (LCP) and the "Bandwidth Allocation Protocol" (BAP), are used for communication purposes with the AO/DI procedure. The LCP protocol message signals "EchoRequest" and "EchoReply" can, as stated above, be used as a test signal and response signal, respectively, for the method according to the invention. The BAP protocol message signals are used to handle the connection of additional B channels; they are thus those message signals which may be given priority over an existing data transmission in the method according to the invention.

The invention will now be explained in more detail with reference to an exemplary embodiment, which is illustrated in a drawing.

The drawing shows, schematically, a subscriber point SUB in a communications network, and which, in the present case, is an ISDN basic access point. The relevant subscriber point is connected to a switching device in the relevant communications network by means of a range of equipment, and via a connection circuit COC.

The illustrated equipment includes a telephone terminal TEL, a facsimile or fax terminal FX, and a home or personal computer PC. Of these items of equipment at the subscriber point SUB, which are all connected to the connection circuit COC which is, for example, a network termination circuit (a so-called NT circuit) in the ISDN communications network, only the home computer or personal computer PC in conjunction with communications links is significant in the following

text. In conjunction with the connection circuit COC, this personal computer PC in this case represents a data device, between which and a further or other data device, which is still to be considered, data signals can be transmitted.

The connection circuit COC is connected via a range of connecting channels B1, B2 and D to an exchange device, of which only an associated switching device SW is indicated in the present case. A selection node POP, which represents the already mentioned further data device, is in the present case connected via a range of connecting channels BCH to the switching device SW in the abovementioned communications network. This selection node POP makes it possible to produce a connection, and to communicate, with so-called IP-based networks, that is to say networks in which connections can be set up, and data signals can be transmitted, on the basis of an Internet protocol. These networks are indicated as an IP network in the drawing.

The switching device SW and the selection node POP are connected via a packet handling device PHD. The packet handling device PHD is in this case connected via connecting lines TL1 and TL2 to the switching device SW and, respectively, to the selection node POP.

A circuit arrangement in the connection circuit COC is shown in the form of a detail, and this circuit arrangement is used to monitor, and possibly to control, the transmission capacity of a data transmission path which exists between said first data device or the personal computer PC and the other data device POP. In this case, this data transmission path is formed by an SVC channel as the primary channel in said D channel, and, furthermore, on said connecting lines TL1 and TL2, in addition to which at least one user channel (B channel) can also be used as a secondary channel in a situation in which the communications network, which includes the switching

device SW, is an ISDN network. Based on the relationships illustrated in the drawing, the channel arrangement which has just been mentioned contains two user channels B1 and B2. The connecting lines TL1 and TL2 are in this case available, as stated above, for a number of data signal transmissions which take place virtually at the same time, so that its transmission capacity and bandwidth can be used not only for one such transmission.

The abovementioned circuit arrangement, which is contained in the connection circuit COC, comprises a signal generator SIG which can be actuated by the personal computer PC via a connecting line L1, in order to output an output signal corresponding to the respective actuation and in response to it. As will also be seen from the following text, the relevant output signal is in this case a test signal or some other command or request signal, which is initiated by the personal computer PC. This will be described in more detail in the following text.

On the output side, the signal generator SIG is connected via a connecting line L2 firstly to one input IN1 of a processing circuit PRC and secondly to one input of an OR circuit OG, which is connected on the output side to one input A of a splitting circuit COM. This splitting circuit COM is connected by means of a separate output B to one input IN2 of the processing circuit PRC. The relevant splitting circuit COM is connected by means of a connection C, which is used as an input/output connection, to the channel D, which is associated with the data transmission path, and to the connecting lines TL1 and TL2, which are likewise associated with the data transmission path, this channel D being referred to, for short, in the following text as the primary channel. At this point, it should be noted that the splitting circuit can be operated such that it allows data signals supplied to its input connection A to be passed to the connection C

and, via this connection C, to be supplied to the primary channel D, and such that it allows data signals supplied from the channel D to the relevant connection C to be passed to the output connection B.

A connecting line L3, via which data signals can be output from the personal computer PC, is connected to a further input of the already mentioned OR circuit OG.

Furthermore, the input side of a timer TIM is connected to the already mentioned output line L2 from the signal generator SIG. On the output side, the relevant timer TIM is connected to one input IM3 of the processing circuit PRC.

In addition to the already mentioned inputs IN1 to IN3, the processing circuit PRC also has two further inputs IN4 and IN5, to which signals which are used for comparison purposes are supplied via respective connections T1 and T2. The connection T1 is in this case supplied with a comparison signal which is characteristic of a threshold value time, and the connection T2 is supplied with a signal which is characteristic of a defined time period (dümin), whose time duration - as will be explained in the following text - is regarded as not yet being overloaded with regard to the transmission capacity of the data transmission path formed by the primary channel D, TL1, TL2.

In the present case, the processing circuit PRC contains three outputs, which are annotated OV, TCA and DAC, and to which respective control lines L4, L5 and L6 are connected. An output signal, for example, a "1" signal, is produced at the output OV of the processing circuit PRC when - as will be seen from the following text - it is determined that the channel D which forms the data transmission path is overloaded. An output signal is produced at the output TCA of the processing circuit PRC, which indicates the provision or

allocation of a further transmission capacity which can be used in addition to, or instead of, the transmission capacity of said primary channel D, TL1, TL2. Finally, data signals are produced at the already mentioned output connection DAC of the processing circuit PRC which, from the point of view of the connection circuit COC, are supplied in the incoming transmission direction from said other data device POP via the packet handling device PHD, the switching device SW and the splitting circuit COM, to the connection circuit COC via its processing circuit PRC, in order to be passed on to the personal computer PC.

Now that the construction of the circuit arrangement illustrated in the drawing has been explained to the extent necessary for understanding of the present invention, the method according to the invention, and which can be carried out by means of the circuit arrangement under consideration, will now be explained.

In order to monitor the transmission capacity of the data transmission path, which includes the already mentioned primary channel D, TL1, TL2, for data signal transmission between the devices which form the first data device, that is to say in this case the personal computer PC and the connection circuit COC, and the other data device POP, separate test signals are in principle emitted regularly, at time intervals of T, from the relevant first data device to said other or further data device POP. These test signals, which can each, for example, be formed by a so-called ECHO-REQUEST signal corresponding to the protocols used in IP-based networks, are in this case either produced by the personal computer PC itself and are output via the D channel to said other data device POP and, in the process, are, so to speak, passed through the signal generator SIG, or they are output from this signal generator SIG in response to a corresponding command actuation from the personal computer PC. As mentioned above, the relevant test signals pass via the primary

channel D, TL1, TL2 and the switching device SW to the packet handling device PHD, which then passes these test signals to said other data device POP. This process can take place in the course of a packet-oriented switching process, as is actually also the case in the ISDN communications network which has been presupposed as an assumption.

On receiving such a test signal, said other data device POP now causes either the respective test signal itself to be passed back via said transmission path, that is to say the primary channel D, TL1, TL2, to said first data device (PC, COC) once again, or else causes a separate response signal, which is triggered by the respective test signal, to be transmitted back to the relevant first data device. By way of example, this separate response signal can be formed by a so-called ECHO-REPLY signal, corresponding to the protocols used in IP-based networks. In this case, the relevant response signal arrives more quickly at said data device the greater the transmission capacity or bandwidth of the primary channel D, TL1, TL2 being used.

In the present case, the time interval between the transmission of a test signal and the arrival of a response signal, which is sent back from said other data device POP in response to this test signal, is now compared in the processing circuit PRC with a predetermined threshold value time which corresponds to a specific transmission capacity of the data transmission path, that is to say of the primary channel D, TL1, TL2. In order to determine this time interval, which represents a measurement time interval, a counter which is contained in the processing circuit PRC, for example, starts to count in response to the actuation of the input IN1 of the processing circuit by a test signal. The relevant counter stops its counting process when a response signal arrives at its input IN2. A signal which corresponds to the time interval determined in this way can then be compared with a

signal which corresponds to said threshold value time, and is supplied to the connection T1.

The comparison of the measurement time interval with the threshold value time is used to form a comparison result, in response to which a transmission capacity signal, which corresponds to this result, is formed. In the present case, in particular if it is found that the measurement time interval is greater than the threshold value time, the output OV of the processing circuit PRC produces a report signal which indicates that the data transmission path, that is to say the primary channel D, TL1, TL2, is overloaded. In response to this report signal, said first data device, that is to say the personal computer PC, can decide to request additional transmission capacity for a planned data signal transmission. This additional transmission capacity can then no longer be provided on the data transmission path formed by the primary channel D, TL1, TL2, and at least one of the still existing user channels B1, B2 may be used for this purpose as a secondary channel, which in this case passes over a different route than the primary channel. This secondary channel can then be used for data signal transmission instead of, or in addition to, the primary channel which was previously provided for data signal transmission.

The abovementioned timer (TIM) is provided in order to obtain a report signal which indicates that the data transmission path, that is to say the D channel and the connecting lines TL1, TL2, is overloaded even in a situation where said other data device POP does not emit any response signal, or such a response signal is emitted, and is received at said first data device (PC, COC), only after a longer time than said threshold value time. In response to being actuated by a test signal, and once a defined time interval has elapsed, this timer TIM emits an output signal which causes the report signal, which indicates that the data transmission path D, TL1, TL2 is overloaded, to be

emitted before the arrival of a response signal from said other data device POP. In this case, a signal which corresponds to the relevant defined time interval of this timer TIM can be compared with said threshold value time, with the time interval of the timer TIM being such that it corresponds precisely to a defined specific load state, and hence transmission capacity, of the data transmission path D.

The described test of the transmission capacity is carried out at regular time intervals.

In order to avoid starting data signal transmission before adequate transmission capacity is available when an amount of data or data signals exceeding a predetermined amount threshold value is intended to be transmitted from the personal computer PC of said first data device to the other, that is to say the second, data device POP and for whose transmission, for example, it is desirable to have a transmission capacity as is at least provided by the predetermined specific transmission capacity mentioned in the time comparison considered above, the transmission capacity of the data transmission path, or of the primary channel D, TL1, TL2, can preferably be monitored before these data signals are transmitted. This can be done by said first data device PC once again transmitting a test signal, in response to which said other data device sends back a response signal. The time interval between the transmission of the test signal and the arrival of the response signal in the relevant first data device, or in the connection circuit COC associated with it, is then compared with said threshold value time in order to derive, from the difference between these times, a transmission capacity signal which is used to decide whether additional transmission capacity should be requested.

If the time period düakt which has passed since the last time that the transmission capacity was monitored

is shorter than a defined time period dümin, then the transmission capacity of this primary channel D, TL1, TL2 is not deliberately monitored once again. In this case, the time of the start of such deliberate monitoring of the transmission capacity of the relevant primary channel D, TL1, TL2 can be used as the time of origin for regular monitoring of the relevant transmission capacity at defined intervals of T. This then results in a changeover to the fundamental method, considered above, of regular transmission capacity monitoring.

If a major load on or overloading of the primary channel D, TL1, TL2 between said first data device (PC, COC) and said other data device POP is found, then the first-mentioned data device immediately transmits to the second-mentioned data device POP, via the relevant primary channel D, TL1, TL2, only such a message signal, on the basis of which the second-mentioned data device POP supplies to the first-mentioned data device PC an indication signal which indicates the provision of additional transmission capacity, is sent immediately. These signals, which, for example, can be formed by a so-called CALLBACK-REQUEST signal or CALL-REQUEST signal corresponding to the protocols used in IP-based networks, are in this case transmitted with priority over other signals which are to be transmitted via the primary channel D, TL1, TL2. This makes it possible to avoid delays which could otherwise occur in the transmission of such signals, so that the additional transmission capacity required for the data signal transmission to be carried out can be provided quickly, to be precise by allocating one or more of the user channels B1, B2, which represent secondary channels, for the data signal transmission. These secondary channels can then be used instead of the primary channel or, possibly, also in addition to it, for data signal transmission.

The previously mentioned message signal which is transmitted from the first data device (PC, COC) to the other data device POP makes it possible to carry out a procedure, which may include a number of transmission processes, between these data devices for issuing and allocating additional transmission capacity for the planned data signal transmission. In this case, such additional transmission capacity can, however, be allocated to said first data device only if it is available at that time and, possibly, also only if it is urgently required.

The method which is carried out according to the invention for monitoring the transmission capacity of a data transmission path which exists between two data devices, that is to say the primary channel D, TL1, TL2, has been explained above with reference to a circuit arrangement which is essentially included in a connection circuit COC which is associated with said first data device. However, it is possible without any problems for the functions of this circuit arrangement also to be contained in the personal computer PC of the relevant data device, so that all the monitoring and control procedures that have been described above can in practice be handled by this personal computer PC. The connection circuit COC then acts only as a network termination appliance, as is used as an NT access appliance in ISDN switching systems.

Furthermore, the invention for monitoring the transmission capacity between two data devices has been explained only in terms of its application to said first data device which, in the exemplary embodiment under consideration, is formed by the computer PC and by the connection circuit COC which interacts with it. However, the invention can also be used in a corresponding manner or even in addition to and/or by said other data device, the selection node POP. In principle, the present invention can thus be used in or

by at least one of the two data devices under consideration.

Patent Claims

1. A method for monitoring and, possibly, for controlling the transmission capacity of a data transmission path which exists between two data devices and is used for transmitting signals, in particular data signals, and on which a primary channel with a relatively low transmission capacity is used, whose magnitude possibly depends on influences which are outside the control of the two data devices, and which can be replaced or added to by means of one or more secondary channels having a relatively high transmission capacity,
characterized
in that at least one of the two data devices (PC, COC; POP) emits separate test signals to the other data device (POP) at specific times via the primary channel of said data transmission path (D, TL1, TL2),
in that, on receiving the relevant test signals, said other data device (POP; PC, COC) in each case sends back a response signal to said first data device (PC, COC; POP) via the primary channel of the data transmission path (D, TL1, TL2), which response signal either comprises the respective test signal itself or is a separate signal initiated by it,
and in that the time interval between the transmission of a test signal by said first data device (PC, COC; POP) and the arrival of a response signal which is sent back to it from said other data device (POP; PC, COC) is compared with a predetermined threshold value time, which corresponds to a specific current transmission capacity of the primary channel of the data transmission path (D, TL1, TL2), forming a comparison result, in response to which a transmission capacity signal is formed, which corresponds to this result and by means of which, in particular, an overload state of the primary channel can be indicated.

2. The method as claimed in claim 1, characterized in that the transmission of the respective test signal

activates a timer (TIM) which emits an output signal once a defined time interval has elapsed,
and in that, if the relevant output signal occurs before the arrival of said response signal, a transmission capacity signal is emitted which indicates an overload state on said data transmission path (D, TL1, Tl2).

3. The method as claimed in claim 1 or 2, characterized in that said monitoring of the transmission capacity is carried out at regular time intervals.

4. The method as claimed in one of claims 1 to 3, characterized in that, if the amount of data which is present and is to be transmitted from said first data device (PC, COC; POP) to said other data device (POP; PC, COC) is greater than a defined amount threshold value, the transmission capacity is deliberately monitored before transmitting the relevant data.

5. The method as claimed in claim 4, characterized in that further deliberate monitoring of the transmission capacity of said data transmission path (D, TL1, TL2) is inhibited if the time period düakt which has passed since the last monitoring of the transmission capacity is shorter than a defined time period dümin.

6. The method as claimed in one of claims 3 to 5, characterized in that the time of the start of deliberate monitoring of the transmission capacity of said data transmission path (D, TL1, TL2) is used as the time of origin for regular monitoring of the transmission

capacity of the relevant data transmission path (D, TL1, TL2) in time intervals t.

7. The method as claimed in one of claims 3 to 6, characterized in that the signals which are associated with a communication between the two data devices (PC, COC; POP) which is necessary for connection of a secondary channel are sent at the earliest possible time, in particular are transmitted with priority over existing data.

8. The method as claimed in one of claims 3 to 7, characterized in that, in an integrated service digital network (ISDN), a switched virtual channel (switched virtual circuit), which in places runs within a D channel, is used as the primary channel, and at least one B channel is used as the secondary channel.

9. The method as claimed in claim 8, characterized in that the message signals EchoRequest and EchoReply of an Internet link control protocol are used as the test signal and response signal, respectively.

10. The method as claimed in claim 8 or 9, characterized in that, before setting up a B channel, message signals for a bandwidth allocation protocol are used to allocate the bandwidth and transmission capacity to be used, and are transmitted with priority over other data.

11. A circuit arrangement for carrying out the method as claimed in one of claims 1 to 10, characterized in that at least one of two data devices (PC, COC; POP) which are connected to one another via a data transmission path (D, TL1, TL2) has an associated monitoring device (SIG, PRC), which allows a time comparison to be carried out between

a measurement time interval from the emission of a test signal from the relevant data device (SUB) to the other data device (POP; PC, COC) until the arrival of a response signal from this other data device (POP; PC, COC) with a predetermined threshold value time (T1), and in that the relevant monitoring device (SIG, PRC) can emit a transmission capacity signal which corresponds to the respective time comparison result, in particular a report signal which indicates an overload state on the data transmission path (D, TL1, TL2), if said measurement time interval exceeds the relevant threshold value time.

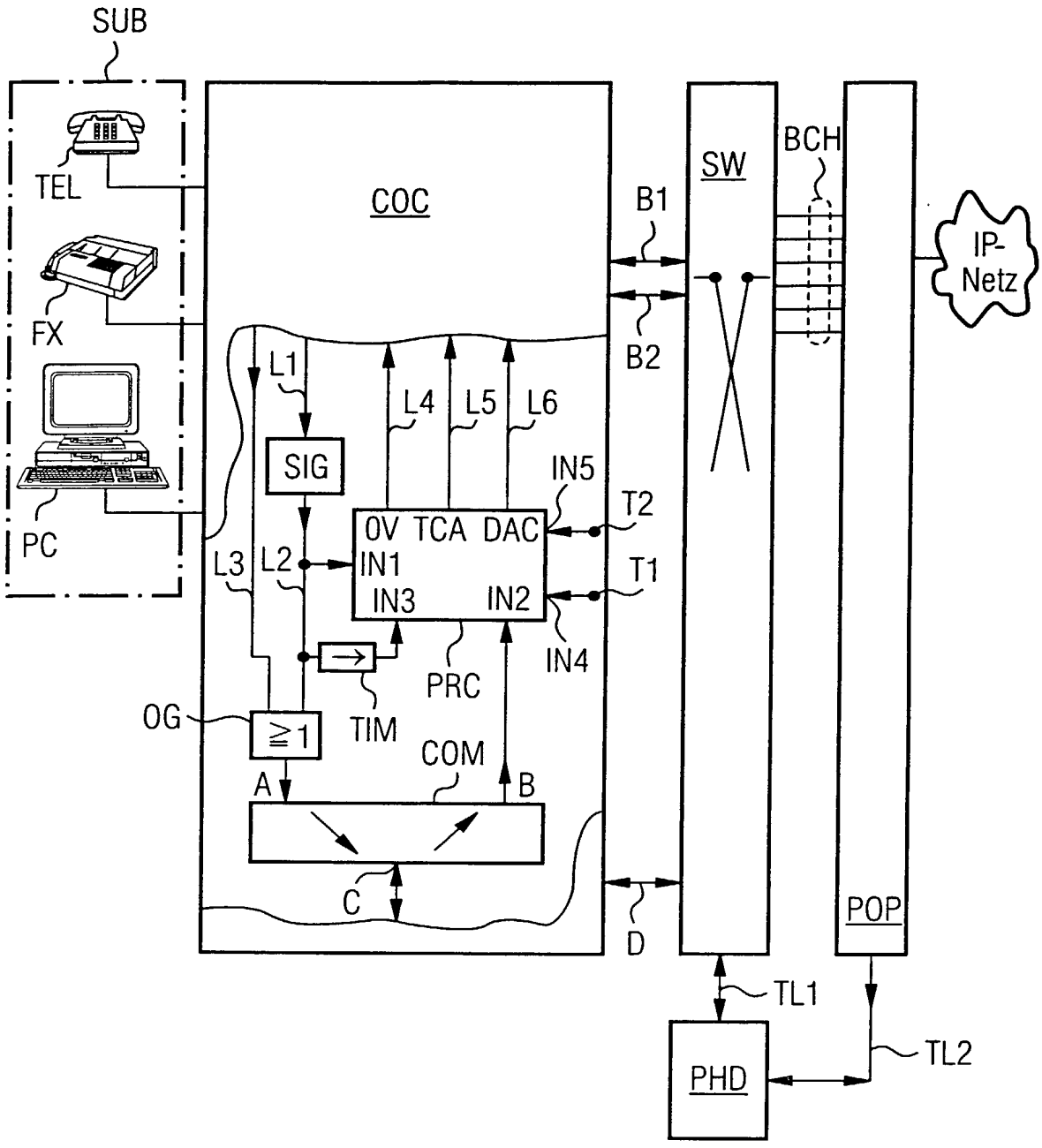
12. The circuit arrangement as claimed in claim 11, characterized in that a timer (TIM) is connected to said monitoring device (SIG, PRC), which can be activated by said test signal and emits an output signal to the relevant monitoring device (SIG, PRC) once its operating time, which corresponds to an overload state of said data transmission path (D, TL1, TL2), has elapsed, which monitoring device (SIG, PRC) uses this output signal, if the response signal from said other data device (POP; PC, COC) has not yet arrived, to emit a report signal which indicates the overload state of the data transmission path (D, TL1, TL2).

Abstract

Method and circuit arrangement for monitoring and, possibly, controlling the transmission capacity of a data transmission path

In order to monitor and, possibly, to control the transmission capacity of a data transmission path (D, TL1, TL2) which exists between two data devices (PC, COC, POP), at least the first data device (PC, COC) regularly or deliberately transmits test signals via the data transmission path (D, TL1, TL2) to the other data device (POP), which then sends back response signals. The time interval between the transmission of a test signal and the arrival of a response signal is compared with a threshold value time, with the comparison result being used to form a transmission capacity signal which, in particular if said time interval exceeds the threshold value time, is a report signal which indicates overloading of the data transmission path (D, TL1, TL2).

Figure


SUB
TEL
FX
PC
COC
SW
BCH
B1
B2
IP-
Netz
L1
L4
L5
L6
SIG
IN5
T2
0V TCA DAC
L3
L2
IN1
IN3
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IN4
PRC
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OG
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COM
A
B
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D
POP
TL1
TL2
PHD

Declaration and Power of Attorney For Patent Application
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German Language Declaration

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☐ hier beigefügt ist.
☒ am 25.07.2000 als
PCT internationale Anmeldung
PCT Anmeldungsnummer PCT/DE00/02440
eingereicht wurde und am _____
abgeändert wurde (falls tatsächlich abgeändert).

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My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Method and circuit for monitoring and optionally controlling the transmission capability of a data transmission channel

the specification of which

(check one)
☐ is attached hereto.
☒ was filed on 25.07.2000 as
PCT international application
PCT Application No. PCT/DE00/02440
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

IDNR: 2590 / V: 99-1.00 / B:Val

German Language Declaration

Prior foreign appplications Priorität beansprucht			Priority Claimed
19934978.9 (Number) (Nummer)	DE (Country) (Land)	26.07.1999 (Day Month Year Filed) (Tag Monat Jahr eingereicht)	☒ Yes Ja ☐ No Nein
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	☐ Yes Ja ☐ No Nein
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	☐ Yes Ja ☐ No Nein

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I hereby claim the benefit under Title 35 United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application.

PCT/DE00/02440 (Application Serial No.) (Anmeldeseriennummer)	25.07.2000 (Filing Date D, M, Y) (Anmeldedatum T, M, J)	anhängig (Status) (patentiert, anhangig, aufgegeben)	pending (Status) (patented, pending, abandoned)
_____ (Application Serial No.) (Anmeldeseriennummer)	(Filing Date D,M,Y) (Anmeldedatum T, M; J)	_____ (Status) (patentiert, anhängig, aufgeben)	(Status) (patented, pending, abandoned)

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Unterschrift des Erfinders Datum: Stefan Geyer 17.12.01	Inventor's signature Date
Wohnsitz: MUENCHEN, DEUTSCHLAND DEX	Residence: MUENCHEN, GERMANY
~~Staatsangehörigkeit~~ Citizenship: DE	Citizenship: DE
Postanschrift: GEISENBRUNNER STR.87 A 81475 MUENCHEN	Post Office Addess: GEISENBRUNNER STR.87 A 81475 MUENCHEN
Voller Name des zweiten Miterfinders (falls zutreffend): PETER SCHNEIDER	Full name of second joint inventor, if any: PETER SCHNEIDER
Unterschrift des Erfinders Datum: Peter Schneider 18.12.01	Second Inventor's signature Date
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~~Staatsangehörigkeit~~ Citizenship: DE	Citizenship: DE
Postanschrift: MARTIN-LUTHER-STR.9 83607 HOLZKIRCHEN	Post Office Address: MARTIN-LUTHER-STR.9 83607 HOLZKIRCHEN

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(Supply similar information and signature for third and subsequent joint inventors).